

AN INVESTIGATION OF THE EFFECT OF TIMING
OF WEIGHING ON BODY IMAGE DISTURBANCE
IN A SAMPLE OF FEMALE UNDERGRADUATES

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ABSTRACT

Body image disturbance is comprised of body dissatisfaction and body size distortion, both of which have been associated with negative health conditions and behaviors. Research has shown that heavier individuals typically express greater body dissatisfaction than thinner individuals. As obesity rates continue to rise, weight management programs that include behavioral components such as self-weighing are prevalent, though some researchers caution that weighing may increase body dissatisfaction and inadvertently interfere with weight loss efforts. This study sought to explore the effect of weighing on body dissatisfaction and body size distortion immediately before and after body image assessment utilizing a figural drawing scale and video distortion technique. Sixty-six female undergraduates were divided by BMI into underweight, normal, and overweight/obese categories. Results indicated there were no significant main effect differences for timing of weighing or BMI category with respect to body dissatisfaction or body size distortion. However, it is noteworthy that findings approached significance with respect to body dissatisfaction and an interaction was observed between timing of weighing and weight category for body dissatisfaction. These findings indicate it is possible that weighing may influence body dissatisfaction to some extent, which may be useful information for clinicians who communicate weight related information and researchers who design procedures for body image measurement.

The form and content of this abstract are approved. I recommend its publication.

Approved: Rick Gardner, Ph.D.

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CHAPTER I

INTRODUCTION

Obesity and weight management are current and pressing major public health concerns. According to the Centers for Disease Control and Prevention website (2010), obesity rates have increased dramatically in the past 20 years, with only the District of Columbia and Colorado reporting obesity rates of less than 20% in 2009. Thirty-three states reported obesity rates of greater than 25% in 2009. Obesity is strongly related to a variety of serious health conditions including sleep apnea, type 2 diabetes, osteoarthritis, heart disease and others (Sarwer, Foster, Wadden, 2004). Billions of dollars are spent each year on direct and indirect costs related to obesity while quality of life is threatened and reduced for millions of people (Field, Barnoya, & Colditz, 2002). Direct costs include diagnosis and treatment of obesity related disease while indirect costs typically include items such as lost productivity (Field et al., 2002). It is estimated that direct costs related to obesity amount to 7% of health care expenditures or 70 billion dollars (Field et al., 2002). Colditz (1999) estimated indirect costs at 48 billion dollars in 1995.

Beyond financial considerations, there are numerous behavioral and psychosocial consequences that accompany obesity including discrimination, negative stereotypes, economic hardship, depression, body image dissatisfaction, and self-esteem issues (Neumark-Sztainer & Haines, 2004). Obese and overweight individuals face challenges at all ages, and many of the social consequences of obesity stem from negative cultural attitudes and beliefs (Neumark-Sztainer & Haines, 2004). Body image is often a significant concern of overweight and obese individuals, which can negatively impact behavior (Phelan & Wadden, 2004; Sarwer, Foster, & Wadden, 2004).

Unfortunately, social acceptance can be largely appearance based and individuals that are heavier than the norm can face rejection, teasing, and limited opportunities for romantic relationships (Neumark-Sztainer & Haines, 2004). Obese individuals are at risk for experiencing negative economic consequences as well. Some researchers have shown that overweight women completed less years of school and had lower incomes (Gortmaker, Must, Perrin, Sobol, & Dietz, 1993). Studies have also shown that health care providers and educators may hold negative stereotypes about obese individuals. For instance, a study by Neumark-Sztainer, Harris, and Story (1999) examined weight-related attitudes of middle and high school teachers and health workers. Results revealed that approximately 25% of respondents perceived that obese students had more family problems than non-obese students and approximately one-fifth expressed that obese students were less likely to succeed, less tidy, and more emotional. There is also some evidence that health care providers may endorse negative beliefs about obese individuals. A study by Price, Desmond, Krol, Snyder, and O'Connell (1987) found that 39% of family physicians perceived their obese patients to be lazy, 34% perceived them as sad, and approximately 67% claimed they lacked self-control. Negative attitudes of health care providers are especially critical in that many obese individuals may be hesitant to seek health care services in the first place (Olson, Schumaker, & Yawn, 1994; Fontaine, Faith, Allison, & Cheskin, 1998). Fontaine et al. (1998) found that after adjusting for health insurance status, income, education, age, race, and smoking status, BMI was significantly associated with the delay of medical appointments. Specifically, obese women were more likely to cancel or delay preventative appointments in particular such as gynecologic examinations, clinical breast examinations, and Papanicolaou smears.

Olson et al. (1994) found that the most common reason for delaying appointments was related to embarrassment about weight, which was more likely for women with larger BMIs. The same study found that 55% of women with a BMI greater than 35 and 32% of women with a BMI greater than 27 either cancelled or delayed appointments because they would be weighed. Finally, from a health management standpoint, overweight individuals are more likely to engage in unhealthy weight control behaviors and less likely to engage in regular physical activity (Newmark-Sztainer & Haines, 2004).

Obesity is difficult and complex medical condition for health professionals to manage, as many individuals prefer confidentiality about their weight due to the social stigma associated with obesity (Hatahet & Dhurandhar, 2004). Many individuals enrolling in weight management treatment programs face significant distress in relation to body image, and body image and self-esteem are the most frequent reported reasons for enrolling in treatment programs (Phelan & Wadden, 2004; Ramirez & Rosen, 2001). Despite the fact that body image disturbance can be a significant cause of distress and is a primary motivator for treatment, the majority of weight loss programs do not include body image as a consideration or a target for treatment (Foster & Matz, 2002; Cash, 1996; Rosen, 1996). Body image concerns can suggest a negative prognosis, as they may persist despite weight loss leaving individuals vulnerable for “relapse” or engagement in negative health behaviors (Schwartz & Brownell, 2002).

Health professionals continue to investigate effective interventions to assist people with weight loss and maintenance efforts. Among the most commonly applied and most effective are behavioral techniques in weight management programs (Fujimoto et al., 1992). Self-management or monitoring skills such as self-weighing have been

utilized as key components of various successful interventions (VanWormer, French, Pereira, & Welsh, 2008; National Heart, Lung, & Blood Institute, 2000). Self-monitoring or self-weighing components stem from self-regulation theory, where motivation for behavioral change is initiated from a comparison from one's actual to one's ideal state (Welsh, Sherwood, VanWormer, Hotop, & Jeffery, 2009). The monitoring of one's weight provides an opportunity to observe how changes in behaviors or activities equate to body weight changes and the number on the scale can become a positive reinforcer for effort (Butrym, Hill, & Wing, 2007). Additionally, Welsh et al. (2009) suggest that frequent self-weighing may work to improve self-efficacy related to weight loss efforts. In a systematic review conducted by VanWormer et al. (2008), 11 out of the 12 studies reviewed found that frequent self-weighing (daily or weekly) was associated with greater weight loss, maintenance of loss, or less body weight when compared to infrequent self-weighing. Levitsky, Garay, Nausbaum, Neighbors, and DellaValle (2006) looked at female freshman college students who participated in a daily weight monitoring exercise that resulted in no weight gain for participants who weighed themselves compared to non-treatment controls who showed an approximate weight gain of 2 to 3 kilograms or 4.4 to 6.6 pounds over a 7 day period. The National Weight Control Registry evaluates factors associated with long-term weight loss and maintenance, and found that 44% of successful dieters weighed themselves on a daily basis and 31% on a weekly basis (Klem, Wing, McGuire, Seagle, & Hill, 1997). Linde, Jeffery, French, Pronk, and Boyle (2005) looked at two groups of 1,226 and 1,800 adults enrolled in either a weight gain prevention or weight loss trial. Results revealed that a higher frequency of self-weighing was associated with less weight gain and greater weight loss over a 24 month period.

Linde et al. (2007) investigated the association between self-monitoring of weight and BMI, as well as depression. They utilized an epidemiologic survey of 4,655 women between the ages of 40 and 65. Self-weighing frequency categories included daily, weekly, monthly and never and the Patient Health Questionnaire (PHQ) was utilized to assess depression symptoms. Study results revealed that a lower BMI was associated with a higher frequency of self-weighing in both depressed and non-depressed women. The investigators found no evidence that frequent self-weighing was associated with depression.

A study by Wing, Tate, Gorin, Raynor, and Fava (2006) examined the effects of a self-regulation program that emphasized self-weighing on weight loss maintenance over an 18 month period. Each of the 314 participants had lost a minimum of 10% of their body weight 2 years prior to the study. The primary outcome measure in the study was weight gain over the 18 month study period. Results indicated that daily weighing was associated with a significant decrease in risk for regaining of weight (82%). Greater weighing frequency was also related to increases in restraint and decreases in disinhibition and depression.

Definition of Body Image Disturbance

Body image disturbance is comprised of two distinct and independent attitudinal and perceptual components that require separate measurement techniques (Gardner & Boice, 2004). The attitudinal component of body image refers to the cognitive and emotional aspects or feelings about one's body, commonly referred to as "body dissatisfaction". There are numerous ways of quantifying body dissatisfaction, but a

commonly accepted method is to take the difference between an individual's perceived body size and the size they would like their body to be ideally.

The perceptual component of body image disturbance refers to an individual's ability to accurately report one's body size, a term known as "body size estimation" or "body size distortion". Research on body size distortion has been primarily related to eating disorders such as anorexia nervosa, and individuals with eating disorders generally overestimate body size (Sepulveda, Botella, & Antonio Leon, 2002; Cash & Deagle, 1997). Research with non-clinical populations has examined various factors including depression, obesity, hunger, and media influences that may affect how accurately an individual sees her or his body (Gardner, 2010). Body size distortion is typically measured by comparing an individual's reported perceived size to her or his actual size.

The large majority of body image research focuses exclusively on the attitudinal component of body image disturbance or body dissatisfaction, but it is important to consider both the attitudinal and perceptual components as each may have a unique and distinct relationship with the initiation and maintenance of health comprising behaviors.

Body image disturbance is an important health factor associated with compromised mental and physical health conditions (Muenning, Jia, Lee, & Lubetkin, 2008). For instance, research has indicated the attitudinal component or body dissatisfaction can be predictive of engagement in a variety of negative health behaviors such as binge eating, fasting, lower levels of exercising, and increased cigarette smoking (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006). Body dissatisfaction has also been correlated with depression, anxiety, low self-esteem, and obsessive-compulsive tendencies (Levine & Smolak, 2002). Research often overlooks the perceptual

component of body image in non-clinical populations, though the relationship between body size distortion and eating disorders is well established as noted earlier. Body size distortion has also been correlated with depression in females in a number of studies (Fabian & Thompson, 2006; McCabe, Ricciardelli, Sitaram, & Mikhail, 2006; Taylor & Cooper, 1986; Thompson & Thompson, 1986; Grubb, 1993).

Body Weight and Body Image

Research findings have clearly established a relationship between body weight or body mass index (BMI) and the attitudinal component of body image disturbance or body dissatisfaction, with heavier individuals expressing higher levels of body dissatisfaction than thinner individuals. According to the Center for Disease Control and Prevention website, BMI is calculated from height and weight measurements (weight in pounds / [height in inches]² x 703), and is used to provide a universal measure of body fat and health. Blowers, Loxton, Grady-Flesser, Occhipinti, and Dawe (2003) examined the relationships between BMI, sociocultural pressures of thinness, social comparison, internalization of the thin ideal, and body dissatisfaction in a sample of 153 girls age 10 to 13 years. Investigators weighed and measured participants to calculate BMI following completion of the questionnaires. Results showed that BMI was significantly associated with body dissatisfaction ($r = .44$, $p < .001$) as measured by the body dissatisfaction subscale of the Eating Disorders Inventory (EDI-BD).

Anderson, Eyler, Galuska, Brown, and Brownson (2002) examined socio-demographic factors including BMI, perceived health, and attempts to lose weight in relation to satisfaction with body size. The study included 1,700 overweight and obese women over the age of 40. BMI was calculated from participant-reported height and

weight. Investigators did not specify if they collected height and weight data before or after questions related to body size satisfaction. Body satisfaction was associated with a lower BMI, with women who were classified as obese being less likely to express body satisfaction than overweight women, though over half (52.5%) of the women sampled indicated they were satisfied with their body size.

Yates, Edman, and Aruguete (2004) examined BMI in relation to body dissatisfaction in 933 male and female college students with differing ethnic backgrounds. BMI was calculated from participant-reported height and weight data. Investigators did not specify whether demographic questions that included height and weight were given prior to questions related to body dissatisfaction. Results indicated that BMI and body dissatisfaction were positively correlated in both males ($r = .60, p <.0001$) and females ($r = .61, p < .0001$).

Chen, Gao, and Jackson (2007) designed a study to develop predictive models for body dissatisfaction in a sample of 1,424 male and female Chinese students between the ages of 12 and 22. Variables investigated in the study included BMI calculated from participants' self reported height and weight, perceived teasing, perceived sociocultural pressure, physical appearance comparison, thin-ideal internalization, perceived social support, and body dissatisfaction. Demographic variables including height and weight were collected prior to completion of the body dissatisfaction measure. Results revealed that BMI was positively correlated with body dissatisfaction both in males ($r = .36, p < .001$) and females ($r = .49, p <.001$).

Watkins, Christie, and Chally (2008) examined affective and cognitive components of body image in relation to BMI category in a sample of 188 college men.

The researchers conceptualized the affective component of body image as weight/shape concern and the cognitive component as body dissatisfaction. BMI was calculated from participant self-reported height and weight, and categories included underweight, normal weight, overweight, and obese. Researchers did not specify whether they collected the participant height and weight data before or after collecting information about body image. Results revealed significant differences among weight categories for both body dissatisfaction and weight/shape concerns. Specifically, obese, overweight, and underweight participants reported higher levels of body dissatisfaction than normal-weight participants. With regard to the weight/shape concern component, overweight men scored significantly higher than the underweight, normal weight, and obese men.

Chen, Fox, Haase, and Ku (2010) examined factors associated with body dissatisfaction in 883 Taiwanese adolescents aged 12-16 years. Factors included in the study were body dissatisfaction, body image, self-esteem, perfectionism, socio-cultural ideals, leisure time physical activity, and demographic variables that included BMI. BMI was calculated from self-report height and weight and participants were classified into two groups of normal/underweight and overweight/obese. Investigators did not specify whether height and weight data was collected before or after participants completed body dissatisfaction measures. Results of the study indicated that four variables were associated with body dissatisfaction in boys including BMI, satisfaction with physical appearance, self-esteem, and internalization of thin ideals. In the girl participants, all of the variables were associated with body dissatisfaction, with the exception of perfectionism. Bivariate correlations revealed that higher BMIs were associated with higher levels of body dissatisfaction in both females ($r = .60, p = .01$) and males ($r = .31$,

$p = .01$). Multiple regression analyses revealed BMI to be the strongest unique predictor of variance of body dissatisfaction for both genders. The model that also included perceived overall appearance and internalization of socio-cultural ideals accounted for 47% of the variance in body dissatisfaction for girls and 14% for boys.

Goldfield, Moore, Henderson, Buchholz, Obeid, and Flament (2010) recently examined the relationship between weight status and body image, depressive symptoms, and eating behavior in a sample of 1,490 youth between the seventh and twelfth grades. BMI was calculated from height and weight measures taken by the researchers and was classified into categories that included obese, overweight, and normal weight based on the International Obesity Task Force Guidelines. Height and weight measurements were taken privately after participants completed the surveys in the classrooms. Results demonstrated a clear relationship between BMI classification and body dissatisfaction, with obese youth reporting higher levels of dissatisfaction than overweight youth, who reported higher levels of body dissatisfaction than normal weight youth.

Research related to the perceptual component of body image disturbance or body size distortion and body weight has been sparse, and findings less definitive. Studies have found evidence of underestimation, overestimation, and accuracy in relation to normal-weight individuals (Schwartz & Brownell, 2002). Two reviews of the literature have examined whether weight is related to body size distortion. Polivy, Herman, and Pliner (1990) examined whether there were differences in the way obese individuals estimated their body size when compared to normal weight control participants. The researchers concluded that all participants exhibited a tendency to overestimate body size, and there were not significant differences in body size distortion between obese and

normal weight participants. However, a meta-analysis by Friedman and Brownell (1995) examined weight in relation to body size distortion and concluded that weight is moderately related to body size distortion (mean $d = .55$), with overweight individuals consistently overestimating their body size.

A study by Gardner, Gallegos, Martinez, and Espinoza (1989) looked at body size distortion in 44 obese and normal weight participants, and found no significant differences between groups. In this study, researchers measured participants' height and weight prior to assessment of body size distortion. A study by Gardner, Morrell, Watson, and Sandoval (1989) with 40 volunteers from the university and local community resulted in similar findings, with no differences observed between normal weight and obese participants in relation to body size distortion. The investigators measured participants' height and weight prior to data collection in this study as well.

Probst, Braet, Vandereycken, De Vox, Van Coppenolle, and Verhofstadt-Deneve (1995) compared body size distortion between a sample of 41 obese children and 42 normal weight children and found that children who were obese were more accurate than children of normal weight in estimating their body size. The investigators measured the children's height and weight following the assessment procedure. Given the limited research and inconsistency in findings in relation to body weight or BMI and body size distortion, additional study in this area is warranted.

Cognitive Behavioral Theory

The majority of current body image research is derived from a cognitive and/or behavioral framework, and cognitive-processing models of body image disturbance are among some of the fastest growing theories (Cash, 2002a; Thompson, Heinberg, Altabe,

Tantleff-Dunn, 1999). The overarching idea of cognitive behavioral theory is that cognitive processes mediate experience (Pike, Devline, Loeb, 2004). According to the cognitive model, emotions and behaviors are influenced by an individual's interpretation of an event or situation, rather than the event or situation itself (Beck, 1995). The way an individual interprets a situation is influenced by a number of factors on different levels that may be more or less accessible to the individual (Beck, 1995; Pike et al., 2004). The cognitive model proposes that an individual's interpretation of a situation is influenced by initial automatic thoughts, which are guided by underlying core beliefs or fundamental truths about an individual, other people, and the world (Beck, 1995; Pike et al., 2004). Core beliefs are typically rigid, transcend specific situations, and are initiated by early developmental experiences (Beck, 1995; Pike, et al., 2004). Automatic thoughts are more situation specific, and may not be immediately obvious (Beck, 1995; Pike et al., 2004).

Cash (1996, 2002) developed a model rooted in cognitive behavioral theory that proposes that dysfunctional body experiences are caused by a combination of historical and proximal influences. Historical influences help to shape specific body image attitudes or "schemas" in a similar manner that core beliefs are developed and are influential in Beck's cognitive model (Cash, 1996). Body image schema has been defined as "an organization of information about one's physical self", which can have either a positive or negative tendency and when activated can influence emotional states (Thompson, Heinberg, Altabe, & Tantlett-Dunn, 1999). Markus, Hamill, and Sentis (1987) describe schemas about the self as "structures of cognitive and affective

representations that pertain to our physical characteristics, our attitudes and preferences, and our behavioral regularities”.

The historical influences or developmental experiences that help to shape body image schemas or body image attitudes include physical characteristics, personality attributes, interpersonal experiences, and cultural socialization (Wertheim, Paxton, & Blaney, 2004). Physical characteristics can include such things as BMI or physical changes in appearance resulting from puberty, aging, or trauma (Cash, 1996). Personality attributes or traits include social confidence and self-esteem and the extent to which an individual places importance and value on appearance (Cash, 1996). Interpersonal experiences can include teasing about one’s appearance (Cash, 1996), which is the most common form of social teasing that occurs in childhood (Shapiro, Baumeister, & Kessler, 1991). Cultural socialization is related to the influence of societal messages about physical standards of beauty including attitudes and values about appearance that are communicated by family of origin (Cash, 1996).

In addition to historical and developmental influences, Cash’s model includes proximal events and processes that are responsible for how people experience body image on a day-to-day or situational basis. According to the model, body image schema can be influenced by “activating events” such as weighing, exercising, looking in the mirror, eating, wearing certain clothes, changes in appearance, social comparisons, or body exposure (Cash, 1996; Wertheim, Paxton, & Blaney, 2004). Activating events subsequently trigger explicit or implicit internal dialogues, which include automatic thoughts, interpretations, or conclusions that often reflect cognitive errors. As described in Beck’s cognitive model, errors in thinking or internal dialogue drive emotional

experiences or as Cash (1996) terms them “body image emotions”, which influence behaviors that seek to lessen the impact of unpleasant emotions such as compensatory action, avoiding situations, body concealment behaviors, or seeking social acceptance (Cash, 2002a; Wertheim, Paxton, & Blaney, 2004). Behavioral responses are maintained through negative reinforcement, as they help to reduce or remove emotional distress (Cash, 1996; Cash, 2002a; Wertheim, Paxton, & Blaney, 2004).

It is important to note that body image can be conceptualized and assessed from both a trait and a state perspective, and the majority of research is focused on the more cross-situational or trait-like aspects of body image (Cash, 2002b). The state-like aspects of body image related to situational or activating events as described in Cash’s cognitive behavioral model, which activate or trigger pre-established attitudes or traits (Cash, 1996). To illustrate, a woman may generally be dissatisfied with her weight (trait-like characteristic) but her thoughts and feelings about her body may become more pronounced when she is exposed to certain activating events or situations (state-like characteristic) (Cash, 2002b). Experimental manipulation is a way to examine the interplay between body image traits and body image states related to contextual events (Cash, 2002b).

Weighing and Body Image

Despite encouraging and positive results obtained with weighing and weight loss and maintenance, some researchers caution there may be negative psychological and/or behavioral consequences of weighing (Dionne & Yeudall, 2005; McFarlane, Polivy, & Herman, 1998; Ogden & Wyman, 1997). Given that heavier individuals typically express greater levels of dissatisfaction than thinner individuals, it is important to

consider whether weighing may exacerbate the issue and increase vulnerability to negative behaviors that may compromise their health. Ogden and Wyman (1997) point out that the psychological consequences of weighing could include increased body dissatisfaction, depression, and lowered self-esteem. Behavioral consequences could include abandonment of dietary restraint and overindulgence in food or binge eating (McFarlane, Policy, & Herman, 1998). Garner, Rockert, Olmstead, Johnson, and Coscina (1985) suggest that for women in particular, the scale can be an emotional barometer and weigh-ins can influence mood and self-evaluation. A few studies have looked specifically at the effect of weighing on the attitudinal component of body image disturbance or body dissatisfaction and related mood states and associated behaviors.

Newmark-Sztainer, Van den Berg, Hannan, and Story (2006) conducted a longitudinal study with 2,516 self-weighing adolescents to evaluate changes in body weight and disordered eating behaviors including body dissatisfaction. Study participants completed surveys that focused on various factors associated with weight concerns and eating. While investigators assessed body dissatisfaction, unfortunately they did not mention it specifically in their results. Findings revealed that frequent self-weighing was not associated with weight changes five years later, although frequent self-weighing predicted weight increases in the younger female sample. Frequent self-weighing also predicted unhealthy weight control behaviors and disordered eating in the female participants.

A pilot study by McFarlane, Polivy, and Herman (1994) examined the effects of weighing and not weighing in dieters on self-evaluative and mood measures, and found that dieters who were weighed expressed lower levels of self-esteem than those not

weighed, though results were not powerful (McFarlane, Polivy, Herman, 1998). In a follow-up study, McFarlane, Polivy, and Herman (1998) tested the effects of weight manipulation in female undergraduate restrained and non-restrained eaters on mood, self-image, eating restraint, self-esteem, and weight and shape concerns. Study participants were told they weighed five pounds lighter, five pounds heavier, or were not weighed. Effects of the manipulation were visible in the restrained eating group only. The restrained eaters who weighed heavy reported significantly more negative moods, lower positive moods, lower self-esteem, and ate more than restrained eaters who were not weighed and weighed light. Weight and shape concerns were measured with the Body Shape Questionnaire, and a significant main effect for restraint was observed with restrained eaters reporting more shape and weight concerns than unrestrained eaters, though no other significant effects were observed. Interestingly, the restrained eaters reported higher anxiety in both of the weighing conditions (heavy and light), suggesting that merely stepping on the scale is a distressing event for this group. Worsening of mood and self-deprecation occurred after weight was communicated to the restrained eaters.

Ogden and Evans (1996) examined the effect of weighing and assignment to weight conditions (underweight, average weight, overweight) on mood, self-esteem, and body dissatisfaction in 74 normal weight participants. While all study participants were within a normal weight range, the study sought to investigate the effect of communicating manipulated weight standards to participants after taking their weight. After investigators recorded participant weights, they told approximately one-third of the participants they were underweight, one-third they were normal weight, and one-third they were

overweight. Questionnaires examining mood, self-esteem, and body dissatisfaction were completed both before and after weighing participants and assigning them to the various weight conditions. Results revealed that individuals who were assigned to the overweight condition exhibited a decrease in self-esteem and increase in depression. Individuals who were told they were in the average weight group reported improvements in depression and mood. The underweight group also showed decreased depression with decrease in self-esteem. However, no main effect of time or condition by time interaction was noted for body dissatisfaction. Notably, there were significant main effects of condition, with the overweight group expressing greater body dissatisfaction compared to average and underweight groups.

Ogden and Wyman (1997) utilized a repeated measures longitudinal design with 30 normal weight females to evaluate the effects of repeated weighing on body dissatisfaction, mood, self-esteem, and eating behavior. Study participants were asked to either weigh themselves every day or only at the beginning and end of a two week period. All of the study participants completed rating scales both at the beginning and at the end of the two week period. With respect to body dissatisfaction, participants assigned to the every day weighing condition indicated greater body dissatisfaction as measured by discrepancy between reported present and ideal body size, though this finding was not observed on the body shape questionnaire (BSQ).

Welsh, Sherwood, VanWormer, Hotop, and Jeffery (2009) examined self-weighing frequency in relation to body satisfaction and weight change. The study included 63 participants enrolled in a randomized-controlled weight loss program for 6 months. Self-weighing was encouraged of all participants as well as daily recording of

weight. Participants were asked about weighing habits at baseline and after six months. Measures of body satisfaction include the Eating Disorder Inventory (EDI-9) and the Body Shape Questionnaire (BSQ-16). Results revealed that change in the frequency of self-weighing was not significantly associated with body dissatisfaction as measured by either the EDI-9 or the BSQ-16. Participants who increased weighing frequency had improved scores on the BSQ-16 at six months.

Welsh, Sherwood, VanWormer, Hotop, and Jeffery (2009) utilized findings from a six month long randomized controlled weight loss trial to examine the effect of frequency of self-weighing on body satisfaction and weight change. Sixty-three individuals participated in the trial, with a mean age of 49.5 years. Three treatment conditions were utilized in the trial including 10 and 20 sessions of telephone counseling and a self-directed program. Participants were encouraged to weigh and record their weight daily and individuals assigned to the counseling groups were asked to report their weight to their counselor. Self-weighing frequency categories included daily, weekly, and monthly. Results indicated that weighing was not associated with body satisfaction. Higher frequency of weighing was associated with positive weight loss outcomes.

With respect to the perceptual component of body image, no studies have been identified to date that have evaluated the effect of weighing on body size distortion.

Body Image and Gender

Body image disturbance is an important health consideration for both men and women, though research has consistently shown that women typically display significantly higher levels of body dissatisfaction than men. Rodin, Silberstein, and Striegel-Moore (1985) refer to the dissatisfaction that women feel with their bodies as

“normative discontent”. Thompson, Heinberg, Altabe, and Tantleff-Dunn (1999) point out that normative discontent captures the essence of the relationship between women and body image, and is illustrative of the fact that women’s body dissatisfaction is so prevalent it should be considered a “normal” part of a woman’s life experience. A large majority of body image studies have been conducted with female participants given the documented relevance to women’s health issues including eating disorders. Several researchers have recently examined and confirmed the relationship between gender and body image disturbance. For example, Gardner, Friedman, Stark, and Jackson (1999) utilized a longitudinal study to examine body dissatisfaction and body size distortion in 216 girls and boys ages 6 through 14 years old. Study data was collected annually for three years beginning at age six, nine, and twelve. Results revealed a significant discrepancy in dissatisfaction between girls and boys beginning at age 9 with girls showing increased body dissatisfaction over time. Forrest and Stuhldreher (2007) examined patterns and correlates of both body dissatisfaction and body size distortion in a sample of university students over two time points. A total of 1,440 students participated in the first survey and 1,072 participated in the second survey. Females demonstrated significantly more body dissatisfaction than males at both time points (67% and 68%) versus (29% and 35%). Algars et al. (2009) examined the influence of gender, BMI, and age on body image in a sample of 11,498 Finnish women and men aged 18 to 40 years. Results revealed that women exhibited significantly more body dissatisfaction than men. Bearman, Presnell, Martinez, and Stice (2006) conducted a longitudinal study with 428 adolescent eighth grade girls and boys to examine the affect of gender on risk factors associated with body dissatisfaction including parental support deficits, dietary

restraint, negative affect, BMI, and ideal internalization. The final multivariate model revealed that parental support and dietary restraint were significant unique predictors of body dissatisfaction. Girls became significantly more dissatisfied with their bodies over time while boys became more satisfied, though there were no significant interactions between gender and the significant risk factors. Aruguete, Yates, and Edman, J. (2006) looked at gender differences in body dissatisfaction, food restriction, and attitudes about overweight people in a sample of 224 college students. Results revealed that women showed more body dissatisfaction than men as they reported wishing to lose significantly more weight compared to men.

With respect to gender and body size distortion, the majority of research findings have found no significant gender differences with respect to body size distortion, though there have been some inconsistent findings. Gardner and colleagues have examined gender differences in several studies. For instance, the longitudinal study of children 6 to 14 years discussed earlier by Gardner, Friedman, Stark, and Jackson (1999), revealed no differences in body size distortion between genders. Similarly, a study by Gardner, Jones, and Bokenkamp (1995) utilized three difference psychophysical techniques to study body size distortion in a sample of 63 university students. Results revealed no gender differences observed for any method. Gardner and Tockerman (1993) examined body size distortion in 53 undergraduates, and found no differences in body size distortion despite gender differences related to body dissatisfaction with specific body areas. Other studies revealed similar findings, with no gender differences related to distortion, but differences observed in body dissatisfaction (Gardner & Morrell, 1991; Gardner, Gallegos, Martinez, & Espinoza, 1989; Gardner, Morrell, Watson, & Sandoval,

1989; Gardner, Martinez, & Sandoval, 1987). Two studies conducted by Gardner and colleagues observed gender differences related to body size distortion, with men reporting larger body size estimates or greater distortion than women (Gardner, Espinoza, Urrutia, Morrell, & Gallegos, 1990; Gardner, Morrell, Watson, & Sandoval, 1990). It may be that the inconsistency in findings related to body size distortion is related to extraneous variables such as hunger, clothing, mirror feedback included in these studies (Gardner, 2010).

Rationale and Hypotheses

Weight management is an important and current health concern, and is linked to serious medical, psychosocial, and economic consequences including body dissatisfaction. Research has demonstrated that weight management strategies that incorporate behavioral components such as self-monitoring of weight are effective at initiating and maintaining weight loss. Despite encouraging results related to weighing interventions, some researchers have cautioned that weighing may further increase levels of body dissatisfaction in already dissatisfied and distressed individuals, and should be used with caution. In the context of Cash's (1998) cognitive behavioral model, the timing of weighing would be considered an "activating event" with the potential to trigger pre-established body image attitudes or schema resulting in negative body image emotions or disturbance.

Little is known about the effects of weighing before or after body image assessment on body dissatisfaction or body size distortion. Some studies have looked at weighing behaviors, weighing frequency, and weight manipulation in relation to body dissatisfaction, although no known previous study has evaluated whether there would be

significant differences in body dissatisfaction or body size distortion for individuals who were weighed prior to body image assessment compared to individuals weighed after. As body dissatisfaction and body size distortion have undoubtedly shown to be important factors for females in particular, this study will examine these issues in a sample of female undergraduates. The study is intended to be useful to both clinicians and researchers who examine body image and related health concerns.

From a clinical standpoint, study findings may provide some insight about how weighing may affect female participants of varying weights with respect to body dissatisfaction and body size distortion. In the context of Cash's (1998) model, the timing of when participants are weighed may serve as an activating event that interacts with pre-established body image attitudes or schemas resulting in negative body image emotions, measured by body dissatisfaction. Some previous findings suggest it may make a difference whether an individual is weighed before or after body image assessment with respect to body dissatisfaction. If individuals express more dissatisfaction depending on when they are weighed, it may be beneficial to consider how and when weight-related information is communicated to clients or patients as part of weight management or treatment programs. Additionally, research has indicated a definitive relationship between body weight and body dissatisfaction, with heavier individuals expressing more dissatisfaction than thinner individuals. Therefore, it is likely that individuals entering weight loss treatment programs are already experiencing relatively high levels of body dissatisfaction (O'Neil & Brown, 2005). It is important for clinicians to understand how activating or proximal events may influence body dissatisfaction, as it has been associated with engagement in a variety of negative health

behaviors such as fasting, binge eating, or lower levels of exercise (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006). Body dissatisfaction has also been associated with negative mood states such as depression, low self-esteem, anxiety, and other mental health conditions (Levine & Smolak, 2002). Increased understanding of proximal and activating events that relate to body dissatisfaction would help clinicians to develop accurate and encompassing case conceptualizations to serve as a foundation for more targeted and effective intervention strategies.

As discussed earlier, body size distortion refers to accuracy of perception, and individuals who exhibit body size distortion may perceive themselves to be either larger or smaller than they actually are. As discussed earlier, body size distortion has been shown to be a separate and independent component of body image disturbance. Previous research has suggested that depression, eating disorder behaviors, and body weight may be associated with body size distortion, although few other consistent factors have been identified (Gardner, 2010). Accuracy of body size may be relevant with regard to weight management and treatment programs in that individuals are looking to make changes to their current body size toward a healthier size, so the ability to accurately judge one's size would be extremely relevant. Distorted perceptions in body size may influence an individual's level of acceptance as well as may put them at risk for eating disorder behaviors that could interfere with weight gain or loss efforts. No previous research has been identified that has looked how weighing may affect perception or body size distortion specifically.

Study findings may be also useful to researchers who design and implement procedures to assess body image disturbance. If the timing of weighing participants is

shown to have a significant impact on body dissatisfaction and/or body size distortion, researchers may want to consider alterations in methodological design or note the timing of weighing as a factor in the methods or discussion section. A significant number of body image studies include a weighing component as part of data collection. A review of recent body image studies revealed that researchers are generally inconsistent with administration of the weighing procedure, with some studies weighing participants prior to body image assessment and some studies weighing participants after. None of the studies reviewed made a specific note of the methodological design with respect to timing of weighing participants and none deliberately counterbalanced weighing administration as in the present study design.

While there are numerous ways to assess and measure body image disturbance, the methods chosen for this study have demonstrated reliability and validity for both body dissatisfaction and body size distortion. Rather than relying on a singular measurement technique to quantify the dependent variables, two techniques are utilized in an effort increase the validity of the data gathered. Both the figural drawing scale and the video distortion technique are widely used methods for measuring body dissatisfaction and body size distortion. Previous research has shown differences in the results obtained from the figural drawing scale and the video distortion technique (Gardner & Brown, 2010a). In the study by Gardner and Brown (2010a), the video distortion technique revealed less body size distortion and body dissatisfaction than measurements taken with the figural drawing scale. As the dependent variables are conceptually related and moderately correlated with one another, a MANOVA is an appropriate statistical analysis to employ (Leech, Barrett, & Morgan, 2005). By using a

MANOVA, one is able to detect relationships between the dependent variables and avoid familywise error or increasing the probability of inappropriately rejecting the null hypothesis (Type I error) that can occur when running multiple ANOVAS (Field, 2005).

The study's primary area of focus is to explore whether weighing female participants immediately before or immediately after body image assessment has a significant effect on either body dissatisfaction or body size distortion. The study will also evaluate significant differences in body dissatisfaction and distortion in relation to participant weight category (underweight, normal, overweight/obese) and whether there is an interaction effect between weight before or after assessment and weight category.

Study Aim 1: How does weighing immediately before or immediately after body image assessment affect body dissatisfaction of female participants of differing weight categories? The following null hypotheses will be tested:

Hypothesis 1: There will be no statistically significant differences between female participants weighed immediately before body image assessment and participants weighed immediately after assessment as measured by the figural drawing scale and the video distortion method of adjustment.

Hypothesis 2: There will be no statistically significant differences between weight categories (underweight, normal, overweight/obese) in relation to body dissatisfaction as measured by the figural drawing scale and the video distortion method of adjustment.

Hypothesis 3: There will be no interaction effect between weight category and weight before or after assessment in relation to body dissatisfaction as measured by the figural drawing scale and video distortion method of adjustment.

Study Aim 2: How does weighing immediately before or immediately after body image assessment affect body size distortion among female participants in differing weight categories?

The following null hypotheses will be tested:

Hypothesis 1: There will no statistically significant differences between female participants weighed immediately before body image assessment and participants weighed immediately after assessment in relation to body size distortion as measured by the figural drawing scale and the video distortion method of adjustment.

Hypothesis 2: There will be no statistically significant differences between weight categories (underweight, normal, overweight/obese) in relation to body size distortion as measured by the figural drawing scale and the video distortion method of adjustment.

Hypothesis 3: There will be no interaction effect between weight category and weight before or after assessment in relation to body size distortion as measured by the figural drawing scale and video distortion method of adjustment.

CHAPTER II

METHODS

Participants

Participants were recruited from undergraduate psychology classes at the University of Colorado Denver. The University of Colorado Denver's Institutional Review Board approved the study. The 66 women who volunteered for the study received extra credit for participation. The mean age of participants was 22.02 ($SD = 4.22$). Participants were Caucasian (75.8%), Hispanic or Latino/Latina (10.6%), Asian American (6.1%), African American (3%), and other ethnic groups (4.5%). Body Mass Index (BMI) ranged from 17.42 to 39.55, with a mean BMI of 23.38 ($SD=4.16$). Study participants were divided into weight categories of underweight, normal, and overweight/obese based on the guidelines suggested by the Center for Disease Control and Prevention. Table 1 illustrates mean BMI per weight category.

Table 1
Mean BMI by Weight Category

	<i>M</i>	<i>SD</i>	Minimum	Maximum
Underweight	17.95	.33	17.42	18.34
Normal	22.01	1.57	19.17	24.61
Overweight/Obese	29.02	3.5	25.70	39.55

Measures

Body dissatisfaction and body size distortion were measured using the Body Image Assessment Scale – Body Dimensions (BIAS-BD) figural drawing scale by Gardner, Jappe, and Gardner (2009) and computer software using the video distortion method of adjustment developed by Gardner and Boice (2004). In a recent review,

Gardner and Brown (2010b) evaluated existing figural drawing scales to compare how various scales address important methodological concerns such as reliability and validity, scale coarseness, restriction of range, and capacity to measure both components of body image disturbance or body dissatisfaction and distortion. The review concluded that researchers should aim to use figural drawing scales with published test-retest reliability of a minimum of Nunnally's (1970) criterion of .70 and ideally meet Carmine's (1990) criterion of .80. Other recommendations included utilizing a scale without clothing or body details that presents a larger number of images in random order. Additionally, not every scale has the capability to measure the perceptual component of body image disturbance or body size distortion, so utilizing a scale with figures that represent calculable BMI is necessary.

The BIAS-BD consists of 17 male and 17 female contour line drawings or figures representing a range of BMIs from thin to obese presented in random order as shown in Figure 1. The BIAS-BD was created using body dimension data from the United States Air Force Material Command, and includes weight values from 60% below average to 140% above average. Each of the 17 figural drawings represents incremental changes of 5% in BMI values. Clothing and body details were intentionally omitted from the original scale in order to create an ethnically neutral scale and to focus participant attention exclusively on body size. During assessment, participants are asked to select the figure that most closely resembles their perceived actual body size as well as the image that represents the size they would like their body to be ideally. The discrepancy between the “perceived actual” and “ideal” figural drawing selections is a measure of body dissatisfaction. The percent of body dissatisfaction is computed by taking (BMI

ideal from scale – BMI perceived actual from scale) / BMI perceived actual from scale x 100. For example, if a participant chooses a perceived actual figure with a BMI of 26.41 and a ideal figure with a BMI or 22.24, body dissatisfaction would be determined to be $(22.24 - 26.41) / 6.41 \times 100$ or -15.79, meaning that the participant wishes their body to be 15.79% thinner. Body size distortion is calculated by taking the difference between the participant's actual BMI and the BMI of the figure the participant selected as the perceived actual on the scale or $(\text{BMI perceived actual from scale} - \text{BMI actual}) / \text{BMI actual} \times 100$. For example, if a participant has an actual BMI of 25.02 and chooses a perceived actual figure with a BMI or 26.41, body size distortion would be determined to be $(26.41 - 25.02) / 25.02 \times 100$ or 5.56%, meaning this individual perceives themselves to be 5.56% wider than they actually are. Gardner, Jappe, and Gardner (2009) cite test-retest reliability at .72 for ideal size and .86 for actual size and concurrent validity at .76.

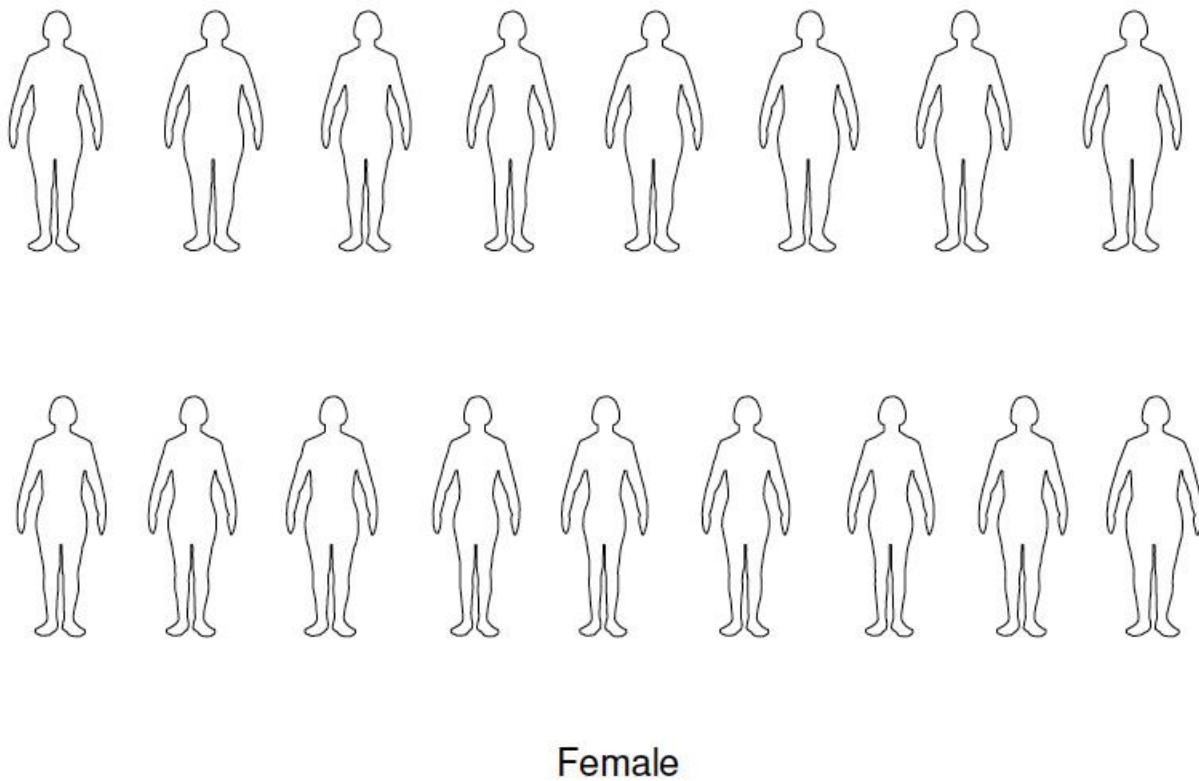


Figure 1. Body Image Assessment Scale – Body Dimensions (BIAS-BD). Female BMI values ranging from 60% below U.S. average to 140% above U.S. average arranged in random order.

A computer software program designed by Gardner and Boice (2004) provides psychophysical measurements of body dissatisfaction and body size distortion. The method of adjustment is a methodology within the program utilized for this study. The method of adjustment presents a static digital image of the participant that is initially distorted randomly between 20% to 30% too wide or too thin and the participant is asked to make adjustments to the image until the image matches her or his perceived actual size. The participant adjusts a total of 10 different images, with 5 images initially too wide and 5 images initially too thin. The participant is then asked to follow the same procedure for the size they would like their body to be ideally. Body dissatisfaction is

represented as the percentage of difference between the adjusted actual and adjusted ideal size. Body size distortion is the percentage difference between the participant's actual digital image and the adjusted perceived image.

Design and Procedure

Student volunteers reported individually to the psychology laboratory on campus to complete the assessments. Demographic information including age, ethnicity, height, and weight were recorded for all participants. Researchers alternated the administration of the height and weight measurements so that approximately half the participants were weighed before assessment and half were weighed after assessment. Participants were asked to judge their perceived actual body size and the size they would like their body to be ideally using both the figural drawing scale and the computerized video distortion method of adjustment. This study is cross-sectional and correlational in nature. Following data screening for outliers and testing of assumptions, data were analyzed utilizing 2 x 3 (time of weighing of before or after assessment by group of weight category of obese/overweight, normal, and underweight) factorial MANOVAs.

CHAPTER III

RESULTS

The first hypothesis under the first study aim stated that there would be no significant differences between female participants weighed immediately before body image assessment and participants weighed immediately after assessment as measured by the figural drawing scale and the video distortion method of adjustment. The second hypothesis under the first study aim stated that there would be no significant differences between weight categories (underweight, normal, overweight/obese) in relation to body dissatisfaction. The third hypothesis under the first study aim stated there would be no interaction effect between weight category and weight before or after assessment in relation to body dissatisfaction. In order to test the first three hypotheses listed under the first study aim, a 2 x 3 (weighing before or after by weight category of obese/overweight, normal, and underweight) factorial Multivariate Analysis of Variance (MANOVA) was conducted combining values from both measurement methodologies as the dependent variable. Table 2 presents the mean body dissatisfaction percentages for each group in the before and after weighing condition.

Table 2

Percent Body Dissatisfaction by Weight Category where Body Dissatisfaction is the Discrepancy between Ideal and Perceived Actual Body Size

	Underweight		Normal		Overweight/Obese	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Figural Drawing Scale	-2.63%	13.0	-16.0%	14.4	-24.2%	7.4
Method of Adjustment	-2.2%	10.0	-11.1%	7.5	-14.3%	5.0

Results indicated there were no significant main effect differences between the dependent variable measures of body dissatisfaction for participants weighed before and participants weighed after assessment, $F(2, 59) = 2.72, p = .07$, therefore Study Aim 1, Hypothesis 1 could not be rejected, although findings closely approached significance. Similarly, Study Aim 1, Hypothesis 2 could not be rejected as there were no significant main effect differences between the dependent measures of body dissatisfaction for the weight categories of underweight, normal and overweight/obese, $F(4,118) = 1.88, p = .12$. A significant interaction was observed between participants weighed before and after and weight category as shown in Figure 1, $F(4,118) = 2.58, p = .04$, therefore Hypothesis 3 under Study Aim 1 is rejected. The interaction suggests that female participants at different weight categories may respond differently to timing of weighing.

Table 3 presents summary information for the MANOVA for body dissatisfaction.

Table 3

Summary Table for Multivariate Analysis of Variance (MANOVA) for Time (before versus after) and Group (BMI category) for Body Dissatisfaction

Effect	Value	df	F	p
Time (A/B)	.92	2	2.72	.07
Group (BMI)	.88	4	1.88	.12
A/B x BMI	.85	4	2.58	.04

Note: Values reported according to Wilks' Lambda

Hypothesis 1 under Study Aim 2 stated that there would be no significant differences in the dependent variables of body size distortion between female participants weighed before and participants weighed after body assessment. Hypothesis 2 under Study Aim 2 stated there would be no statistically significant differences in body size distortion between female participants of differing weight categories (underweight,

normal, overweight/obese). Hypothesis 3 under Study Aim 2 stated there would be no interaction effect between weight categories and whether participants were weighed before or after body image assessment. Table 4 presents the mean body size distortion percentages for each weight group. There were no significant main effect differences between the dependent variable body size distortion for participants weighed before and participants weighed after body image assessment, $F(2,59) = .17, p = .85$, therefore Study Aim 2, Hypothesis 1 could not be rejected. Likewise, Study Aim 2, Hypothesis 2 could not be rejected as there were no significant main effect differences between the dependent variable body size distortion for weight categories of underweight, normal, and overweight/obese, $F(4,118) = .17, p = .96$. Study Aim 3, Hypothesis 3 also could not be rejected as there was no significant interaction between whether participants were weighed before and after and weight category, $F(4,118) = .79, p = .53$. Table 5 presents summary information for the MANOVA for body size distortion.

Table 4

Percent of Body Size Distortion by Weight Category where Body Size Distortion is the Discrepancy between Actual Body Size and Perceived Body Size

	Underweight		Normal		Overweight/Obese	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Figural Drawing Scale	9.2%	13.2	7.1%	17.7	7.6%	10.3
Method of Adjustment	-4.4%	5.2	1.2%	6.1	-2.4%	6.3

Table 5

Summary Table for Multivariate Analysis of Variance (MANOVA) for Time (before versus after) and Group (BMI category) for Body Size Distortion

Effect	Value	df	F	p
Time (A/B)	.99	2	.17	.85
Group (BMI)	.99	4	.17	.95
Time X Group	.95	4	.79	.53

Note: Values reported according to Wilks' Lambda

CHAPTER IV

DISCUSSION

The purpose of this study was to provide information about how the timing of when one is weighed may impact two different components of body image disturbance. Specifically, the research questions were designed to assess whether weighing female participants of differing weight categories before or after body image assessment would have a significant impact on body dissatisfaction and body size distortion. The attitudinal component of body image disturbance or body dissatisfaction was defined as the difference between an individual's perceived body size and the size she would like to be ideally. The perceptual component of body image disturbance or body size distortion was defined as the difference between an individual's actual and perceived body size.

It was anticipated that this study might have utility in both clinical and research arenas. With respect to clinical relevance, the study examined timing of weighing as an “activating event” with respect to Cash’s (1998) cognitive behavioral model of body image development and experiences. The study findings provide information about how female undergraduates in this sample respond to the timing of being weighed with respect to body dissatisfaction and body size distortion, which may be useful information for weight management programs that include a weighing component to help facilitate behavior change. For example, if study participants were to have expressed greater body dissatisfaction when weighed either before or after assessment, programs might consider doing weigh-ins either before or after program to increase potential for engagement and participation. This is the first known study to examine the effect of time of weighing on

satisfaction and perception of one's body using two different measurement methodologies.

Results from the analysis related to body dissatisfaction supported two of the three hypotheses that stated there would be no difference in body dissatisfaction with respect to time (weight before or weight after) or group (BMI category). More specifically, the main effect of weight before and weight after was not significant, indicating that female participants who were weighed before body image assessment did not express significantly more body dissatisfaction than participants who were weighed after. These results are consistent with some previous research findings related to weight monitoring, weight loss or maintenance, and emotional distress that found no significant relationship between weighing and body dissatisfaction. The current study results indicate that the timing of when an individual is weighed does not serve as a significant activating event in Cash's cognitive behavioral model (1998), as participants generally expressed similar levels of dissatisfaction when weighed before as opposed to after. It may be prudent to consider these findings with caution however, as the results closely approached significance suggesting the possibility that effects may be observed in a larger sample.

The main effect of weight category was also not statistically significant with respect to body dissatisfaction, meaning that underweight, normal, and overweight/obese groups did not exhibit significantly different levels of dissatisfaction. This finding is contrary to previous research, which has consistently shown body weight to be a significant predictor of body dissatisfaction, with individuals at heavier weights expressing greater dissatisfaction than those at lighter weights. It is difficult to

understand these results in the context of prior research; the lack of differences between the groups may be due to the small sample size or variability within the groups.

While the current findings do not indicate that timing of weighing had a statistically significant main effect on body dissatisfaction, as noted earlier, the weighing component closely approached significance suggesting the possibility that a relationship might be realized in a larger or alternative sample or with other measurement techniques. In addition, a significant interaction was observed between the time of weighing and weight category, indicating that the timing of weighing may affect females at various weight categories differently with respect to body dissatisfaction. While it appears that the underweight group may be affected differently by the timing of weighing, it is difficult to draw conclusions about the significant interaction given the small number of participants.

Based on Cash's (1998) model of body image development and experiences, historical and developmental influences are unique to each individual and include physical characteristics. An individual's weight or size may influence the development of positive or negative body image attitudes or schemas that consequently influence responses to activating events. To illustrate an example, an underweight female may have received continuous social praise about her physical appearance or small size, which contributed to a schema that interprets weighing as a negative threat to her personal worth. Weighing this individual prior to assessment may activate her schema such that she expresses more dissatisfaction than she would have had the assessment been taken prior to revealing her weight.

It is noteworthy that in both the normal and overweight/obese groups, participants expressed slightly greater levels of body dissatisfaction when weighed after body image assessment than when weighed before, though this effect was not statistically significant. It is unclear how to interpret this observation, given the lack of other relevant findings. One possibility is that weighing these groups after body image assessment served as an activating event by way of anticipation about being weighed at some point in the future, and therefore resulted in increased negative evaluations about size. It is possible that weighing individuals before assessing their body image alleviated anticipation about a negative result, which was reflected in reduced levels of body dissatisfaction. According to the model, the anticipation about being weighed may have interacted with the body image schema of normal and overweight/obese participants.

While it is difficult to draw any concrete conclusions from the current findings given the small sample size and lack of significance, it still may be useful for clinicians to provide an opportunity for clients to process emotional issues related to weighing and weight changes given the importance of body image in relation to weight management and general health (McFarlane, Polivy, & Herman, 1998). Researchers that assess body image in either clinical or non-clinical settings should be aware of the possibility that timing of weighing may influence assessment results and researchers may choose make note of it how and when participants were weighed in the methods and discussion section of published studies.

The study also examined weighing and weight category in relation to body size distortion. Results from the current analysis supported each of the three hypotheses that there would be no difference in body size distortion with respect to time (weight before

or weight after) or group (BMI category). The main effect of time of weight before or weight after was not significant, indicating that individuals who were weighed before assessment expressed similar levels of body distortion to those who were weighed after assessment. The main effect of weight or BMI category was also not significant in relation to body size distortion, which is consistent with some research findings and inconsistent with others. For example, the review by Polivy, Herman, and Pliner (1990) found no differences in the accuracy of normal control and obese participants. Other studies have shown a relationship between body size distortion and body weight. For instance, the meta-analysis by Friedman and Brownell (1995), found moderate effect sizes in relation to weight and that obese individuals overestimate their body size. The study by Probst, Braet, Vandereycken, De Vox, Van Coppenolle, and Verhofstadt-Deneve (1995) found obese children to be more accurate than normal weight children in relation to body size distortion. Similarly, a recent study by Gardner and Brown (2010c), observed differences between weight categories with respect to body size distortion, with individuals in obese categories displaying significantly less body size distortion than those in overweight or normal weight categories. It is unclear how to interpret the current findings in the context of previous research, although some of the discrepancy is likely to do with differences in measurement techniques employed by various studies.

In addition to clinical relevance, the results of this study may also be useful to investigators that measure body image disturbance with respect to methodological considerations and study design. The majority of body image studies include a measure of participant height and weight and BMI, and this information is collected a variety of different ways including self-report and by researchers measuring each participant.

While the current findings are not statistically significant, they are suggestive of a possible relationship between timing of weighing and body dissatisfaction that is not being detected with the current sample, which may be useful information when determining study procedures and design. It may be advisable for researchers to note that particular individuals may be affected by whether their weight is measured before or after assessment. Additional research may be able to shed light on these ideas and provide further guidance to researchers and clinicians.

Limitations

Despite the fact that the study focuses on a relevant and important population with regard to body dissatisfaction and body size distortion in university aged women, the findings in this study may not generalize to other populations. For instance, it was not known whether any of the participants were enrolled in weight management or treatment programs and the majority of participants were in the normal weight range according to BMI. It may be that individuals involved in weight management or treatment programs would respond differently to timing of weighing with respect to body image disturbance. In addition to the unique characteristics of the population sample, the study has a small sample size, which may not have detected significant differences in the conditions and may make it difficult to meaningfully draw conclusions from findings. Study participants were not asked to disclose eating related beliefs or behaviors, so this factor and any influence it may have had on body image disturbance was not possible to explore in the analysis. The study examines the effect of weighing individuals prior to and after body image assessment only, so limited inferences can be made about the effects of weighing in general on body image disturbance. For instance, the study does not include a non-

weighing condition to assess whether being weighed or not weighed has an effect on body dissatisfaction and/or distortion. Additionally, the study did not assess the routine weighing behaviors of participants and how those behaviors may affect body dissatisfaction and/or distortion over the short or long term. Follow up studies could consider a non-weighing control group to compare against participants who were weighed and inquire about weighing behaviors over time in order to investigate the effect of weighing behaviors more thoroughly. A non-weighing control group would test whether participant knowledge of weighing in general is an activating event and affects body dissatisfaction or body size distortion. In other words, it may be possible that participants who know they will be weighed at some point during the study may express more or less dissatisfaction than those who are never told they will be weighed and submit self-report height and weight data. In order to include a non-weighing group however, researchers would need to compute body size distortion from self-reported height and weight data rather than researcher collected data, which may alter the accuracy of body size distortion values. It would still be possible to calculate body dissatisfaction with a non-weighing control group, as body dissatisfaction is computed by taking the discrepancy between perceived actual size and ideal size on the figural drawing scale and software program. Future studies might also include questions about the routine weighing habits of participants to assess how they relate to body dissatisfaction and body size distortion. Lastly, it would be beneficial to look at a larger and more diverse sample by recruiting community members in addition to or in lieu of undergraduate psychology classes or participants in weight management and treatment programs.

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